Exemption No. 5623

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
RENTON, WASHINGTON 98055-4056

In the matter of the petition of

Saab Aircraft AB **Regulatory Docket No. 27155**

for an exemption from §§ 25.562(b)(2)
and 25.562(c)(5) of the Federal
Aviation Regulations

PARTIAL GRANT OF EXEMPTION

By letter RN 150037 dated December 14, 1992, Mr. Arne Axelsson, Vice President, Quality and Airworthiness, Saab Aircraft AB, S-581 88 Linkoping, Sweden, petitioned for an exemption from: the Head Injury Criterion (HIC) of § 25.562(c)(5) of the Federal Aviation Regulations (FAR), for front row passenger seats in SAAB 2000 airplanes until seat retrofits are mandated for all aircraft type certificated after January 1, 1958; and from the floor distortion requirement of § 25.562(b)(2) of the FAR, for the pilot/co-pilot seats in SAAB 2000 airplanes.

Sections of the FAR affected:

Section 25.562(c)(5), as amended by Amendment 25-64, requires that each occupant must be protected from serious head injury under the conditions prescribed in paragraph (b) of this section. Where head contact with seats or other structure can occur, protection must be provided so that the head impact does not exceed a HIC of 1,000 units. The level of HIC is defined by the equation:

$$HIC = \left[(t_2 - t_1) \left[\frac{1}{(t_2 - t_1)} \int_{t_1}^{t_2} a(t)\, dt \right]^{2.5} \right]_{max}$$

Section 25.562(b)(2), in prescribing the conditions under which seats must be tested, requires in pertinent part that where floor rails or floor fittings are used to attach the seating devices to the test fixture, the rails or fittings must be misaligned with respect to the adjacent set of rails or fittings by at least ten degrees vertically (i.e., out of parallel) with one rolled ten degrees.

Related Section of the FAR:

Section 25.785(a), as amended by Amendment 25-64, requires that each seat, berth, safety belt, harness, and adjacent part of the airplane at each station designated as occupiable during takeoff and landing must be designed so that a person making proper use of those facilities will not suffer serious injury in an emergency landing as a result of inertia forces specified in §§ 25.561 and 25.562. (Due to a non-substantive editorial change, these requirements are contained in § 25.785(a) and (b) of current Part 25.)

The petitioner's supportive information is as follows:

The certification basis of the SAAB 2000 airplane includes the § 25.562(c)(5) Amendment 25-64 requirement that where head impact can occur, a HIC of 1,000 units may not be exceeded.

Tests performed by Saab have shown much higher HIC for the front row passenger seats than what is allowed by the regulation, and testing performed by other aircraft manufacturers has revealed that it is very unlikely that a technical and practical solution to this problem will be available in time for the scheduled type certification of the SAAB 2000 on July 1, 1993. Saab therefore petitions for an exemption until the seat retrofit requirements promulgated by Notice of Proposed Rulemaking (NPRM) 88-8 become effective, to require compliance for all airplanes type certificated after January 1, 1958. As justification for this exemption, Saab notes the following:

1. The state-of-the-art does not enable bulkhead walls (galley, wardrobe, closet, etc.) to comply with the HIC requirement.

2. Granting an exemption will not impede development of a technically and economically viable solution.

3. Saab will work together with suppliers for seats and interiors, to undertake reasonable design precautions to minimize head injury at these seats.

4. A development program is also initiated, together with the interiors supplier, in order to develop a solution for the front row seats. Collaboration with the rest of the aviation industry will also be part of this program.

5. When a technical and practical solution is available, it will be implemented in SAAB 2000 production as soon as possible. Saab will also initiate work with the airlines regarding retrofit of SAAB 2000 aircraft already delivered.

The certification basis of the SAAB 2000 also includes the § 25.562(b)(2), Amendment 25-64,

requirement for floor distortion during the dynamic testing of seats. Saab nevertheless chose to exclude floor distortion from their testing, basing this decision on an FAA letter to IPECO Europe Ltd., dated March 5, 1990, in which the FAA stated that it is initiating rulemaking to amend § 25.562 to delete the requirement to test flight deck seats with floor warpage. Subsequently, Saab became aware, in March 1992, that the FAA intends to grant exemption from the floor deformation requirements only if there is 40 inches of cockpit underfloor structure available. Since the SAAB 2000 has less than this 40 inches, Saab petitions for an exemption based on the following:

1. A late FAA decision not to amend § 25.562 to delete the requirement for testing the pilot/co-pilot seats with floor distortion. It was not clear until after the Saab dynamic tests were completed that the FAA would require floor distortion only for aircraft with less than 40 inches of underfloor structure. This means that a redesign of the seats, including additional dynamic testing, would be required for Saab in order to meet the requirement. That will result in commercial penalties to both Saab Aircraft AB and the seat supplier of more than $250,000.

2. The SAAB 2000 cockpit floor design provides a very rigid and stiff support for the pilot/co-pilot seats, preventing floor distortion in a survivable minor crash landing.

A summary of the December 14, 1992, Saab Aircraft AB petition was published in the Federal Register on January 28, 1993 (58 FR 6428). One commenter responded, representing an airline pilot organization, and expressed opposition to the petition. The commenter cites the detrimental effect on passenger and crew safety if exemptions are allowed from HIC and floor warpage test requirements. The commenter states that both the HIC and floor warpage test requirements have been in effect for several years, and that technical solutions are available for complying with those requirements. The commenter notes that the FAA denied Boeing's petition for exemption from HIC requirements on the model 777 airplane, and feels the Saab AB petition for exemption from the same requirement on the SAAB 2000 airplane should receive the same response. The commenter challenges the specifics of the petitioner's claim of financial losses that would be incurred if the petition is not granted, and notes that, regardless of any actual loss amount, these losses should not outweigh the safety benefits of complying with these requirements over the operational life of this aircraft model.

The FAA's analysis/summary is as follows:

The FAA adopted improved seat standards with Amendment 25-64 to Part 25 of the FAR (53 FR 17640, May 17, 1988). That amendment became effective June 16, 1988, and it applies to all transport category airplanes for which an application for type certificate is made after that date. At the same time, the FAA also proposed to amend Part 121 of the FAR to adopt improved seat safety standards for retrofit of older airplane models used in U.S. air carrier service. Because of difficulties in converting older airplanes, the seat safety standards proposed in NPRM 88-8 are not identical to those adopted with Amendment 25-64.

As noted by the petitioner, the type certification basis for the Model 2000 includes compliance with § 25.562(c)(5) as amended by Amendment 25-64. Since these improved standards are contained in the type certification basis of the Model 2000, none of the petitioner's references to the standards proposed in NPRM 88-8 are relevant.

Nevertheless, the FAA concurs with the spirit of the arguments offered by the commenter. As discussed below, the FAA is not prepared to allow the exemptions as petitioned. We are, however, for the reasons indicated below, willing to allow certain temporary relief. Similar relief was not granted to Boeing, due to the considerable amount of time yet available to Boeing to implement design solutions before their scheduled type certification date of April 1995. By contrast, the scheduled type certification date of the SAAB 2000 is imminent, in July 1993.

The FAA has carefully considered the information provided by the petitioner, and has determined that there is sufficient merit at this time, due to the lack of commercially available design solutions to the bulkhead-to-seat HIC problem, to warrant granting an exemption that would allow an extension to the compliance time for meeting the noted HIC requirements. In making this determination, however, the FAA is aware of some tendency in the field of HIC research for commercially undesirable but otherwise technically promising solutions to be rejected by the aviation industry without adequate substantiation, or for reasons relating to aesthetics. Examples include:

1. Aluminum honeycomb added to bulkheads has been shown to reduce HIC below 1,000 units. Concerns by the operators regarding its appearance, and the susceptibility of unprotected honeycomb to in-service damage, have led primarily to continued research into the possibility of protective coverings, rather than to alternative energy-absorbing materials.

2. A four-strap torso restraint, similar to those currently utilized by flight attendants, would restrain the head from contacting any injurious surface. Operators have rejected this option, asserting that the "complicated" central buckle required would be a safety impediment. They further assert, again without substantiation, that this option would necessitate rigid seatbacks that would unacceptably increase the head injury hazard to passengers seated behind the modified seats, and would also adversely affect the development of 16g seats. Concerns of public relations and passenger reaction have also been expressed regarding designs of this nature, as to possible perceptions of an increased level of danger inherent in seats equipped in such a manner.

3. A single diagonal upper torso restraint strap, in combination with the standard lap belt, similar to those in automotive use, may also provide the required restraint. Operators have also declared this potential option as unacceptable, using unsubstantiated reasoning as outlined above.

Articulating seat pans and air bags are also being investigated as possible solutions.

The FAA does not wish a favorable consideration of this petition to be construed as encouragement to other potential petitioners whose justifications may be based solely on unsupported rationales similar to those listed above. Since it is the FAA's intention to foster timely implementation of the HIC requirement, exemptions will not be considered unless the FAA is assured that meaningful research is being accomplished on behalf of the petitioner, and is being conducted in an expeditious manner.

In partially granting this petition, the FAA recognizes primarily the current lack of commercially viable solutions to the HIC problem, and the adverse effect of this problem on the impending scheduled type certification date of the SAAB 2000. The FAA expects that solutions are forthcoming that will be available by the end of this year. At this time, however, the FAA acknowledges that technically feasible solutions have not been developed to the point where they are viable for installation. This situation is expected to change rapidly, and the FAA will expect that all viable solutions are considered, as noted above.

With regard to the petition for relief from the misaligned floor fitting test requirement of § 25.562(b)(2) for pilot/co-pilot seats, the FAA acknowledges that the noted letter has the potential, if not carefully considered, to mislead the recipient into incorrectly assuming that implementation of the stated intentions was a foregone conclusion. It must be noted, however, that regardless of the status of rulemaking that may be contemplated or in progress concurrent with any certification activity, the airplane's negotiated certification basis still determines the requirements that must be met. This is a fact considered be to well known within the aircraft manufacturing community. In developing its product contrary to this convention, the petitioner also apparently overlooked the prompting statement in the noted letter which advised the recipient that the FAA will consider exemptions on the subject, until the rule is amended. Had the petitioner done so in a timely manner, and the FAA had denied that petition, there may have been sufficient time to develop seats that met certification requirements. In partially granting this petition, the FAA is allowing a limited period of time beyond the type certification date of the SAAB 2000 for the petitioner to complete development of the required seats. Cockpit floor characteristics may not be used as a basis for exemption from seat test requirements. The intent behind the rule imposing a misaligned seat fitting test is to assure a certain degree of seat flexibility and is applied irrespective of any floor requirements or anticipated floor behavior. It should be noted that the structure likely to be utilized by the petitioner to achieve the noted high degree of stiffness and rigidity may act to increase crash loading on cockpit occupants, by effectively reducing the fuselage crush distance that would otherwise be available to absorb impact forces.

In consideration of the foregoing, I find that a partial grant of exemption is in the public interest, and will not significantly affect the level of safety provided by the regulations. Therefore, pursuant to the authority contained in §§ 313(a) and 601(c) of the Federal Aviation Act of 1958, delegated to me by the Administrator (14 CFR 11.53), the petition of Saab Aircraft AB for exemption from the HIC requirements of §§ 25.562(c)(5) of the FAR, for front row seats on SAAB 2000 airplanes, is granted until December 31, 1993, with the following provisions:

1. The petitioner shall provide this office, at three-month intervals from the issue date of this grant, a detailed progress report of applicable HIC research accomplished in the previous three months, and a schedule of activity intended for the following three months.

2. Within three months of identifying a design solution(s), the petitioner shall provide this office with a schedule for the retroactive implementation of the solution, and assure its execution by December 31, 1993.

Additionally, the petition of Saab Aircraft AB for exemption from the misaligned floor fitting test

requirement of § 25.562(b)(2) of the FAR, for pilot/co-pilot seats on SAAB 2000 airplanes, is granted until December 31, 1993, with the following provisions:

1. The petitioner shall provide this office, within three months from the issue date of this grant, with a commitment to complete the required testing in a timely manner.

2. Within three months of completing the required testing, the petitioner shall provide this office with a schedule for the retroactive implementation of any design changes required, and assure its execution by December 31, 1993.

Issued in Renton, Washington, on

_____

Transport Airplane Directorate

Aircraft Certification Service

F:\HOME\TWR\SAAB

transferred to F:\HOME\JET\RULES\SAAB ON 3-3-93